

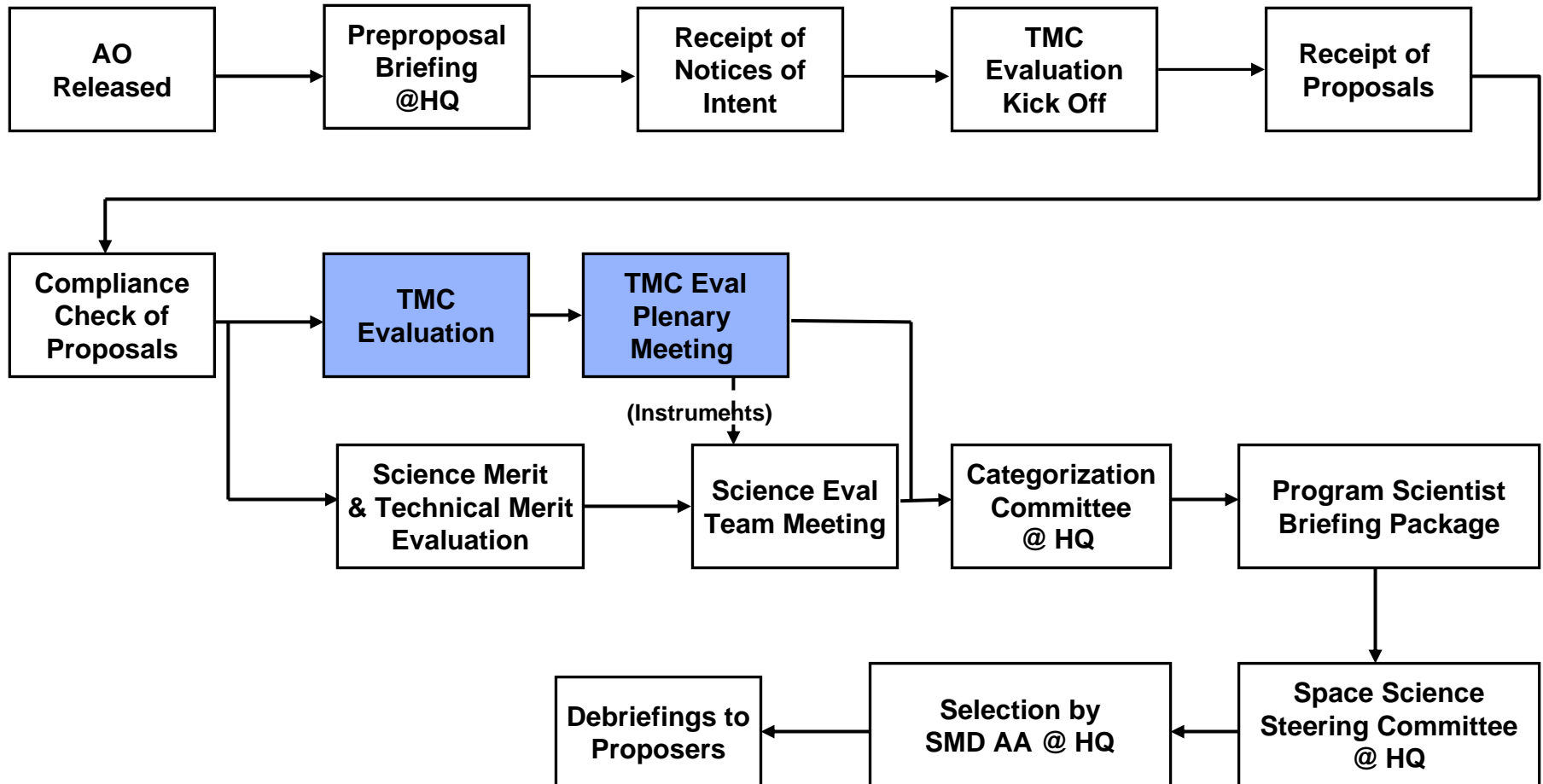


# **New Frontiers Community Workshop**

## **December 5, 2008**

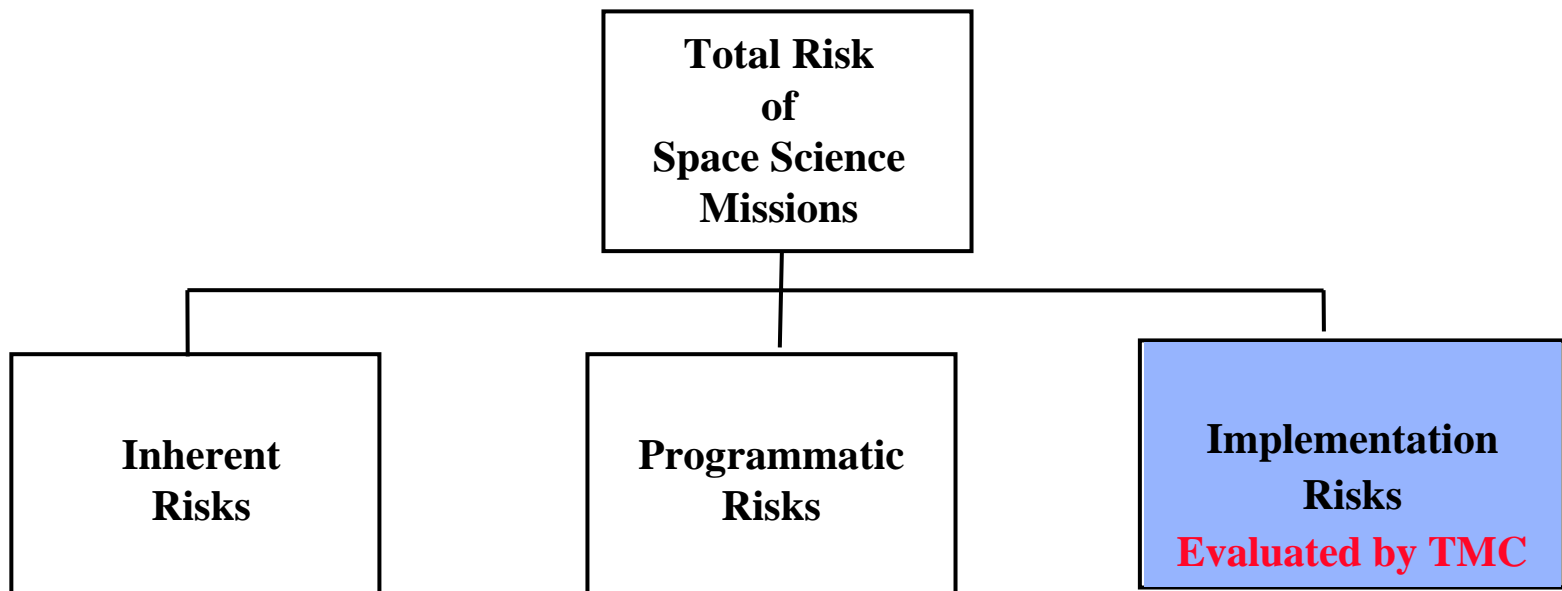
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# New Frontiers Proposal Evaluation Process





# Risks for Space Science Missions



Risks that are unavoidable to do the investigation:

- Launch environments
- Space environments
- Unknowns
- Etc.

Risks that are uncertainties due to matters beyond project control:

- Environmental Assessment approvals
- Budgetary uncertainties
- Political impacts
- Etc.

Risks that are associated with implementing the investigation:

- Adequacy of planning
- Adequacy of management
- Adequacy of development approach
- Adequacy of schedule
- Adequacy of funding
- Adequacy of Risk Management (planning for known & unknown)



# TMC Evaluation Objectives



- **The TMC evaluation estimates the level of risk for accomplishing the scientific objectives of each proposed investigation against the proposed cost and schedule.**
- **There are three Risk Levels: Low, Medium, and High**
  - **Low Risk:** There are no problems in the proposal that cannot be normally solved within the time and cost proposed. Problems are not of sufficient magnitude to doubt the Proposer's capability to accomplish the investigation.
  - **Medium Risk:** Problems have been identified, but are considered within the proposal team's capabilities to correct with good management and application of effective engineering resources. Mission design may be complex and resources tight.
  - **High Risk:** Problems are of sufficient magnitude such that failure is highly probable.

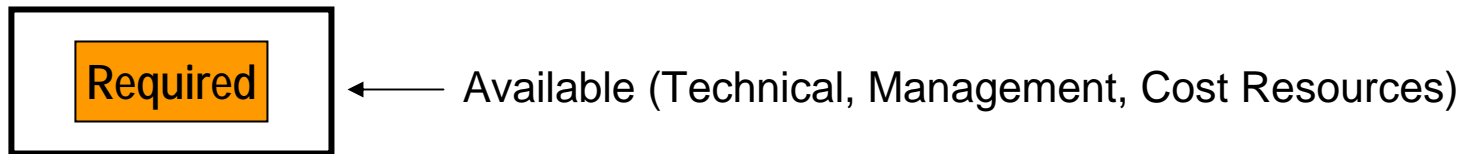


# TMC Envelope Concept

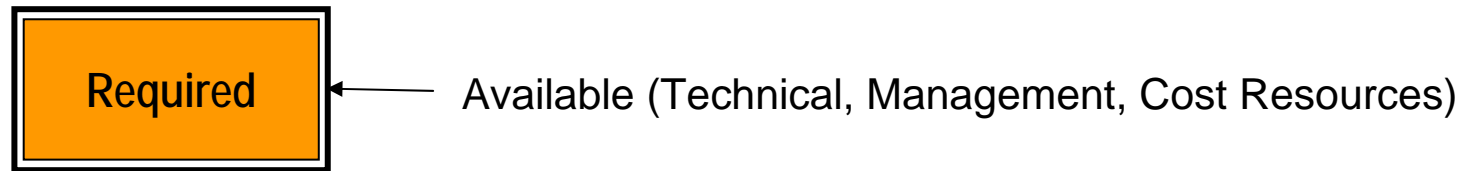


**Envelope:** All TMC Resources available to handle known and unknown development problems that occur. Includes schedule and funding reserves; reserves and margins on physical resources such as mass, power, and data; descope options; fallback plans; and personnel.

**Low Risk:** Required resources fit well within available resources



**Medium Risk:** Required resources just barely inside available resources.  
Tight, but likely doable



**High Risk:** Required resources DO NOT fit inside available resources.  
Expect project to fail





# TMC Independent Cost Assessment



## ***“The Pyramid”***

### Process Steps:

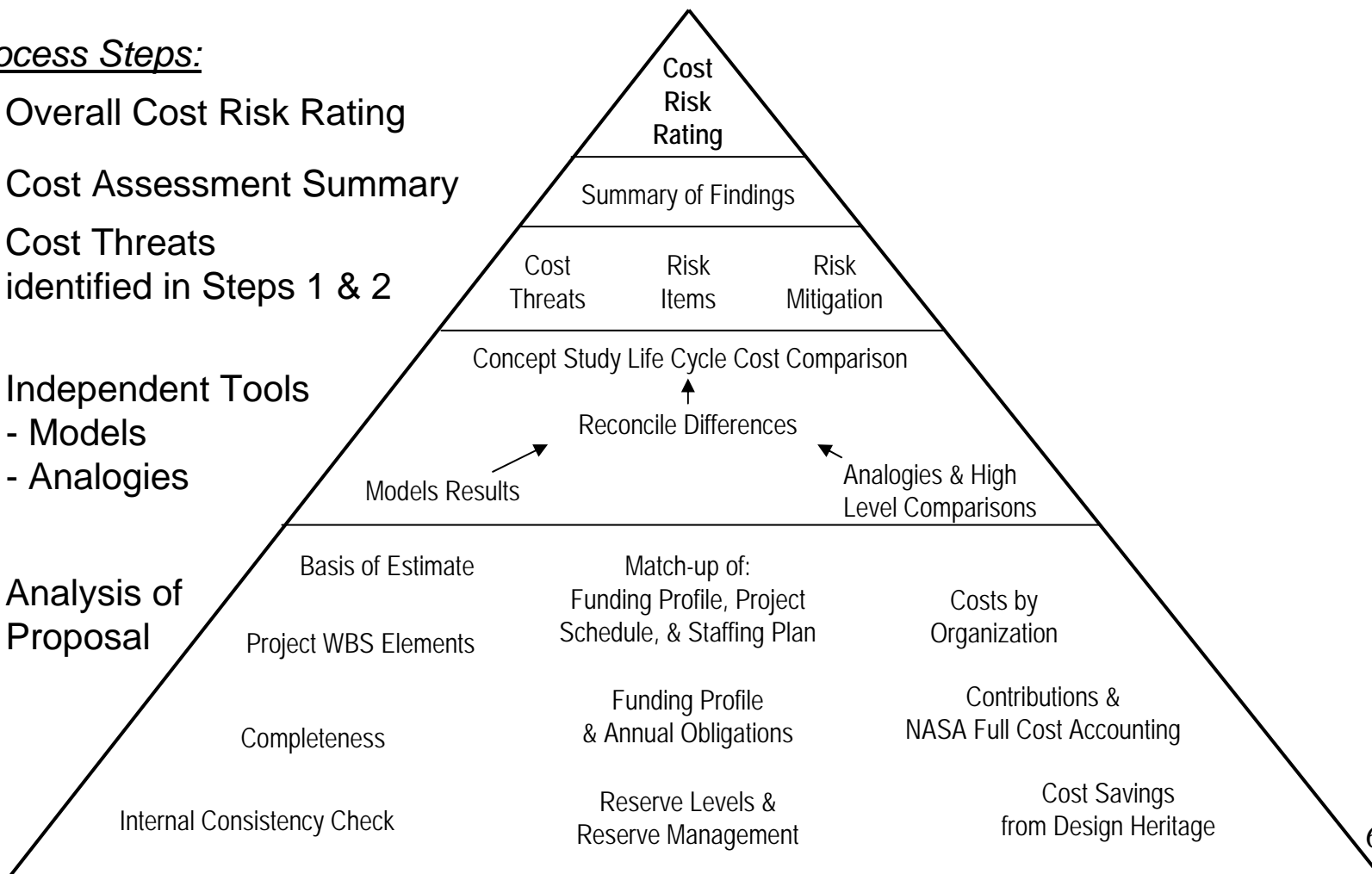
5. Overall Cost Risk Rating

4. Cost Assessment Summary

3. Cost Threats  
identified in Steps 1 & 2

2. Independent Tools  
- Models  
- Analogies

1. Analysis of  
Proposal





# TMC Principles for Evaluation



- **Basic Assumption:** Proposer is the expert on his/her proposal.
  - Proposer's task is to provide evidence that risk is low.
  - TMC's task is to try to validate proposer's assertion of low risk.
- **All Proposals are reviewed to identical standards.**
  - Science Support Office established in 1996 by OSS to support Discovery and Explorer; now also supports New Frontiers, Mars Scout, and others.
  - SSO uses the TMC process to support all SMD evaluations.
  - All proposals receive same evaluation treatment in all areas.
- **TMC Panels consist of evaluators who are experts in the areas of the proposals that they evaluate.**
- **TMC Panels develop consensus findings for each proposal.**
  - Findings: "As expected" (no finding), "above expectations" (strengths), "below expectations" (weaknesses).



# TMC Principles for Evaluation

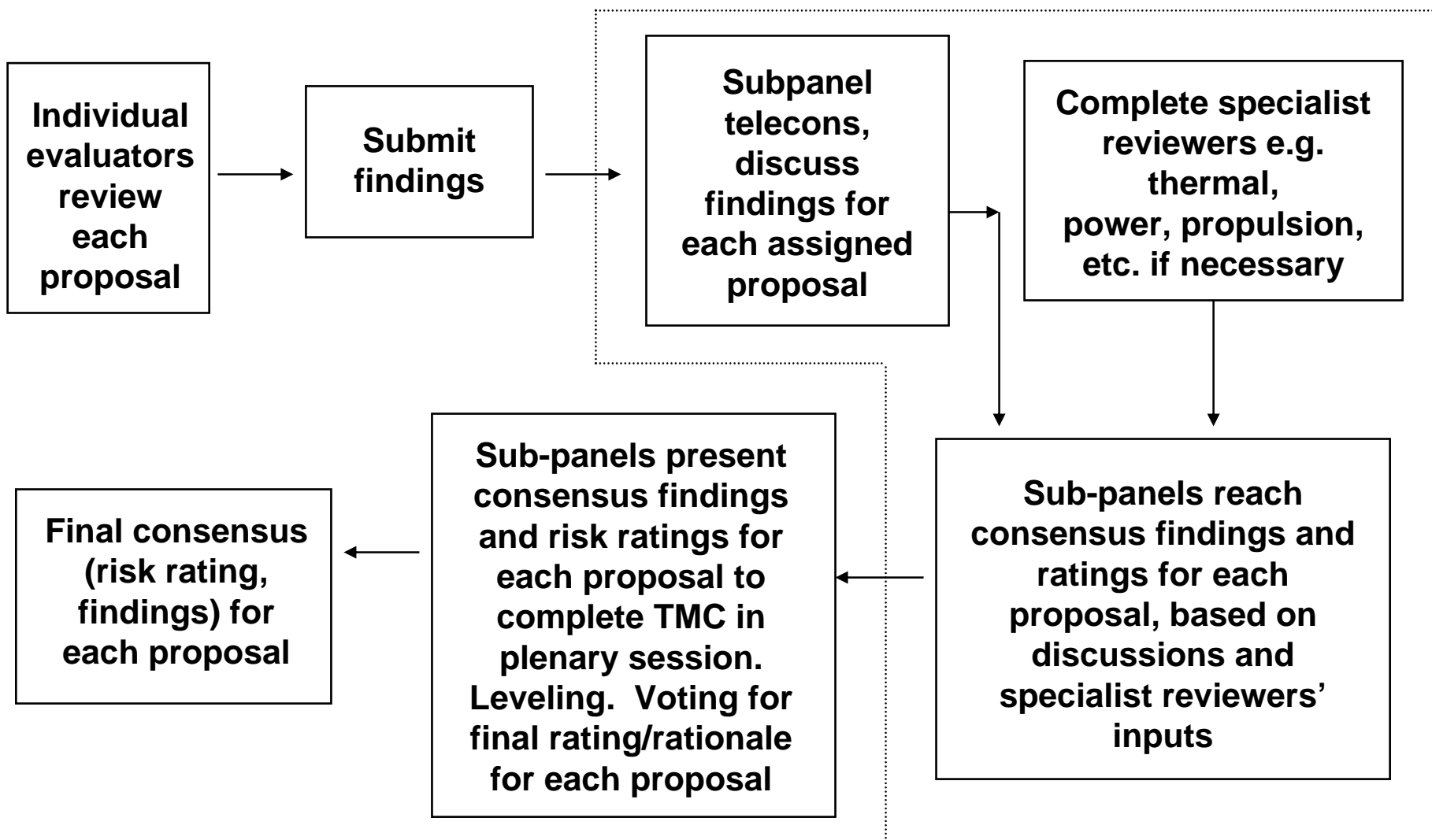


- **Step-One Proposal Risk Assessment:**
  - Step-One proposals are based on pre-phase-A concepts; TMC Risk Assessments give appropriate benefit of the doubt to the Proposer.
  - The Cost Analysis is done without Proposer feedback and is integrated into overall risk.





# TMC Evaluation Flow





# TMC Evaluation Factors and Sub-Factors

Generally, the degree to which Proposals address the following factors directly relates to the grade of Low, Medium, or High Risk:

- **Instrument**
  - Instrument Design, Accommodation, and Interface
  - Design Heritage
  - Environment Concerns
  - Technology Readiness
  - Instrument Systems Engineering
- **Mission Design and Operations**
  - Mass Margins
  - Trajectory Analysis
  - Launch Services
  - Concept of Mission Operations
  - Ground Facilities – New/Existing
  - Telecom
- **Flight Systems**
  - Hardware/Software Design
  - Design Heritage
  - Spacecraft Systems Design
  - Design Margins (Excluding mass)
  - Qualification and Verification
  - Assembly, Test, and Launch Operations
  - Mission Assurance
  - Development of New Technology
- **Management and Schedule**
  - Roles and Responsibilities
  - Team Experience and Key Individuals' Qualifications
  - Project Management and Systems Engineering
  - Organizational Structure and Work Breakdown Schedule (WBS)
  - International Participation
  - Risk Management, Including Descope Plan and Decision Milestones
  - Project-Level Schedule
  - Proposed Subcontracting Plans and SDB Participation.
- **Cost**
  - Basis of Estimate (BOE)
  - Cost Realism and Completeness
  - Cost Reserves by Phase
  - Comparison with TMC Estimates (Including Parametric Models/Analogies)



# TMC Evaluation for SEO and SC



- Innovative Science Enhancement Options and/or Student Collaboration proposals will be considered strengths.
- Evaluated for overall merit, cost and schedule risk.
- **Important** to show that SCs are clearly separable from the primary objectives of the investigation; *i.e.* failure of an SC, for any reason, must not pose any additional risk to mission development or compromise the baseline mission.



# Typical TMC Evaluation Questions



- Will overall investigation approach allow successful implementation as proposed?
- If not, are there sufficient resources (time & \$) to correct identified problems?
- Does proposed design/development allow the investigation to have a reasonable probability of accomplishing its objectives and include all needed tools?
- Are requirements within existing capabilities or are advances required?
- Does the proposal accommodate sufficient resiliency in appropriate resources (e.g., money, mass, power) to accommodate development uncertainties?
- Is there a Risk Management approach adequate to identify problems with sufficient warning to allow for mitigation without impacting the investigation's objectives?
- Does the proposer understand the known risks, including risk of using new developments, and are there adequate fallback plans to mitigate them, to assure that investigation can be completed as proposed?



# Typical TMC Evaluation Questions



- Is the schedule workable?
- Does it reflect an understanding of work to be done and the time it takes to do it?
- Is there a reasonable probability of delivering the investigation on time to meet Discovery Project Schedules?
- Does it include schedule margin?
- Will proposed management approach (e.g., institutions and personnel, as known, organization, roles and responsibilities, experience, commitment, performance measurement tools, decision process, etc) allow successful completion of investigation? Is the PI in charge?
- Does the investigation, as proposed, have a reasonable chance of being accomplished within proposed cost?
- Are proposed costs within appropriate caps and profiles and does cost estimate cover all costs including full-cost accounting for NASA Centers?
- Are costs phased reasonably?
- Is there evidence in the proposal to give confidence in the proposed cost?
- Does the proposer recognize all potential risks/threats for additional costs or cost growth (e.g., late deliveries of components)?



# Characteristics of Low Risk Ratings



- All risks for the project have been/are being identified and managed by the team, with plans to reduce or retire the risk before launch.
- No risk exists for which neither a workaround is planned, nor a very sound plan to develop and qualify the risk item for flight.
- The proposed project team and each of its critical participants are competent, qualified, and committed to execute the project.
- The project will be self managed to a successful conclusion while providing reasonable visibility to NASA for oversight.
- The team has thoroughly analyzed all project requirements, and consequently the proposed resources are adequate to cover the projected needs, including an additional percentage for growth during the design and development, and then a margin on top of that for unforeseen difficulties.
- The schedule includes reserve time, to find and fix problems if things do not go according to plan.
- All contributed assets for the project are backed by letters of commitment.
- The team understands the seriousness of failing to meet technical, schedule, or cost commitments for the project in today's environment.



# Characteristics of High Risk Ratings



- Technical Design Margins (Mass, Power, etc.)
  - Insufficient data provided from which to independently verify the margins.
  - No margin provided or conflicting data provided.
  - Margin provided deemed too low based on the maturity of the design.
- Cost
  - Concerns relating to cost reserve (Below AO requirement, too low based on liens/threats, phasing inconsistent with anticipated needs).
  - Unable to validate proposed cost
- Instrument Implementation
  - Heritage claims not substantiated/development risks not adequately addressed.
  - Inadequate/inconsistent description and detail.
  - Inconsistencies between instrument requirements and bus capabilities.
- Complex Operations
  - More common in payloads containing multiple instrument that required tight scheduling/sequential operations.
  - Inadequately addressing the challenges inherent in lander operations.



# Characteristics of High Risk Ratings,cont'd



- Systems Engineering
  - Incomplete flow-down of science requirements to payload/flight system accommodations.
  - Incomplete description of how the systems engineering function will be executed.
  - Inadequate resources allocated to accomplish this function.
- Management Plans
  - Confusing/conflicting organizational roles and responsibilities.
  - Lack of demonstrated organizational/individual expertise for specified role.
  - Insufficient time commitments for key personnel.
- Schedules
  - Insufficient detail from which to perform an independent assessment.
  - Inadequate/no schedule reserve identified.
  - Overly ambitious schedules that are not consistent with recent experiences.